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PHYSICAL SCIENCES AND TECHNOLOGY
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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

SUGGESTIONS FOR IMPROVEMENT OF SCIENTIFIC-TECHNICAL INFORMATION

Moscow MOSKOVSKAYA PRAVDA in Russian 28 Nov 76 p 2

[Article by K. Vladimirov and Yu. Delegatov, economists]

[Text] According to figures, engineers and scientists who do not keep up with the latest information in their specialized fields lose approximately five percent of their knowledge each year, and thus within 20 years actually are unqualified.

In our country the government does not begrudge funds for the development of information services. But if you ask a worker of a branch institute, factory or unit whether the information he receives is completely satisfactory, you usually will receive the answer "No."

Why is this so?

Seeking the answer to this question, we turned to the State Scientific Research Institute of Scientific and Technical Information (GosINTI), which is primarily responsible for the quality and effectiveness of information reaching personnel of the enterprises and organizations of Moscow.

The Institute's activities are widespread and varied. Its publications include the Bulletin of Technoeconomic Information, the handbook Leading Experience in Agricultural Production, the abstract review Local Leading Experience in Agriculture, Review of Problems of Large Cities, Annotated Informational Maps, and many others.

The following conditions are binding upon publication of information products: first, introduction into practical use in the national economy of the new ideas contained in the publication, and secondly, immediate procurement of the corresponding plans, drawings or other technical data must be possible.

We were informed at the Institute that GosINTI focuses much attention on the selective dissemination of information. What does this mean? Previously the subscriber was forced to receive information on science, in general, or on technology, but now he receives data only on problems of interest to him.

In principle, the above necessarily must enhance the effectiveness of the information process. But here are other data. In 1973, 2,107 technical measures (yielding a savings to the national economy of more than 6 million rubles) were introduced into practice on the basis of information received by enterprises and organizations from GosINTI. In 1975 only 1,000 measures were introduced into practice, twofold fewer than before, and the economic benefit was some sixfold less, only a million rubles.

Is this sum of 1 million rubles large or small? For comparison, let us consider economic efficiency data of the activities of the information service of the Krivorog Metallurgical Plant imeni V. I. Lenin, obtained from the VDNKh (Exhibition of Achievements of the National Economy of the USSR).

In 1973 the economic benefit obtained from practical introduction of technical achievements taken from industrial sources of scientific-technical information totalled 2.8 million rubles, which was only some twofold less than the sum of the economid benefit due to utilization of GosINTI information by 350 enterprises, and 2.8-fold greater than the total benefit from utilization of GosINTI information on 134 enterprises in 1975.

We have before us some of the latest figures from the Bulletin of Techno-economic Information.

The first thing that strikes the eye is a lack of numerical data on the economic effect deriving from introduction into practice of various developments -- machines, mechanisms and instruments. The economic utility of introduction of technical solutions and achievements either is not discussed or is described only in the broadest terms, telling nothing to the specialist involved.

Furthermore, several Information Bulletins do not contain plans, drawings or information on the novelty of technical solutions and achievements, nor the copyright protection of the authors. They contain no editorial commentary or opinion of specialists on the significance of the various technical solutions to problems.

What is the criterion used in evaluating the quality of work of the personnel of the Institute? Actually, it is the number of scientific-technical information data produced. The national economic effectiveness of this data is not taken into account, and thus the interest of GosINTI personnel in this aspect of the problem is lost.

There is also the converse of this problem -- the volume of practical introductions based on the "production" of GosINTI is reduced. This is understandable: not knowing the effect promised by a technological concept, personnel shy away from its introduction.

How is this situation evaluated by the Combine for Direction of Scientific-Technical Information and Propaganda, RSFSR, of the State Committee of the Council of Ministers USSR for Science and Technology?

"Actually," stated Combine Head Ye. A. Chvanov, "the basic indicator of quality in evaluating the informational activity of the Institute is the delivery of scientific-technical information to enterprises and the number of enterprises served.

"Do you consider such indices correct?"

"Definitely. They were compiled on the basis of experience."

"But cannot the criterion of 'economic benefit' serve as the main criterion for evaluating the work of an institute such as GosINTI?"

"It is impossible to answer that question at the present time. We do not have a suitable method, and no one can suggest one for us ..."

This pause gives us much cause for reflection.

We may propose for the instant that the economic effect of practical introduction of developments be systematically derived within the scientific-research institute of the branch ministry. Undoubtedly this will produce a noisy reaction in the ministry. "Oh, of course!" But if the output of GosINTI would decrease, it may be more correct.

From year to year only the volume, the quantitative indices continue to figure in the plans of the Institute. It is true that summaries of the magnitude of economic effectiveness also include data on worker stimulation, but as something secondary, not reflecting evaluation of Institute efficiency.

The publication Main Trends of Development of the National Economy of the USSR for 1976-1980 indicates the need for perfecting the system of scientific-technical information. It is our view that this will require first of all a change in the plan orientation of the GosIN TI information service.

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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

MAXIMIZING EFFECTIVENESS OF COMPUTER TECHNOLOGY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Sep 76 p 2

[Article by Yu. Lapshin, candidate in technical sciences: "The Way Is Shorter; Computer Technology and the Concentration of Production"]

[Text] When speaking about computer technology one still not infrequently may hear the opinion that it is called to lighten administrative labor, to take upon its shoulders tedious computational work requiring a lot of time; it assists in better control and frees people for creative work, etc. This is all true, of course. But at the present time the question is not simply one of advantages, but of the economic efficiency of computer complexes and of their maximal yield.

One must note that the efficiency of automated control systems is not some sort of detached, abstract concept. It is quite actual and is economically based. Therefore in developing the new five-year plan the chief attention was devoted to perfecting the methodology for planning in this area, especially to the creation of some system of indicators which would reflect not only the quantitative, but also the qualitative side of the process which is going on. In connection with this the experience of the last five-year plan was extensively analyzed.

What does it show? First of all, as experience shows, computer technology gives weightier results in industry. Thus, of almost 2 billion rubles of savings received from its application by the national economy in the first year of the last five-year plan, more than two-thirds came from the industrial branches. This tendency also characterized the succeeding years. Computers bring prominent results in machine building and metal processing, in power engineering, in the coal and petroleum industries, and others. But even here the data on their use are not uniform. For example, a large yield is obtained by automating technological processes and production.

Automated control systems have a significant effect in planning-construction and scientific research work--they speed up the time needed to prepare documentation, its quality is improved, and the course from science to production becomes shorter. And it is no accident that according to the Tenth Five-Year Plan scientific research and construction organizations will receive 20 percent of the computer capacity out of the total quantity planned to be introduced in the country.

But how then is efficiency itself determined? The basic criterion is the standards of efficiency developed and confirmed by the management organs, the chief of which is the standardized coefficient of the efficiency of capital investment. In their totality they provide the possibility not only of determining the savings from the application of computers, but also of planning it and placing it into the state plan.

At one time the standardized coefficient of efficiency for the creation of automated systems was established to be equal to 0.3. What does it mean? The yield from each ruble of capital investment should be no less than 30 kopeks a year. In the last five-year plan such a coefficient was expected. In fact overall in the national economy it came to 0.4-0.42. This provided a basis for the planning organs to define it at 0.52 in the Tenth Five-Year Plan. The ratio of savings which may be expected in the national economic plan, in particular, shall we say, from lowering production cost of output is growing correspondingly sharply.

Experience, as well as scientific research, convinces us of one rule in principle: any application of the most modern technology, and above all of computer technology, is economically justified only in conditions of large-scale production based on concentration and specialization. I have in mind all-union industrial associations, scientific-production and production complexes, enterprises which have available the necessary means, resources, and personnel, and of course broad maneuverability in their use. In such complexes an automated control system gives maximal results and is able to solve a whole series of problems placed into its system.

An example of this is the experience of the introduction of an automated control system in the Severodonetsk chemical combine. Although figures are, they say, a dry thing, here we cannot manage without them. So here is how they describe the automated control system. Implemented on a project scale, it has improved the complex's indicators: the output of production increased by 3 percent, the proportionate norms for expenses for raw materials, semimanufactures, and energy resources were reduced by 0.5 to 1 percent, etc. The cost of the whole system was 4.87 million rubles. Almost half of these assets were recovered in 1 year!

And still at times the computer centers are not working at full capacity. So far they still do not possess the set of accompanying devices which constitute the "tentacles" of electronics and which should extract information from its primary source, the section, shop, or even the machine, and transmit it to the computer, the computer center, and then to the managers of the subdivision who would be able optimally to direct planning, accounting, and distribution of resources and directly to control production at all levels.

They do not possess them, because these devices are so far not being output in sufficient quantity. In the last five-year plan the portion of peripheral equipment received for equipping computers, including those of the third generation, in the national economy did not exceed 10 to 15 percent of the total volume of facilities output for computer technology. As a result of the lack of direct-access memory units, magnetic disk memory, data input and output devices,

especially cathode-ray tubes, and other equipment the efficiency of automated control systems was reduced. In the current five-year plan it is planned to increase the share of peripheral equipment in the computer total to almost 50 percent.

We are now crossing the threshold of a qualitative change in the hardware and software for automated control systems. Domestic industry in cooperation with the socialist countries has mastered the output of a family of a unified system of computers possessing a large scope of productivity and equipped with an extensive set of direct-access and auxiliary memory devices. The series production of equipment for teleprocessing and remote data transmission has been planned and started.

I shall not enumerate the merits of modern means of computer technology, of devices for the input and acceptance of information (they are at the "crest" of the best models); once again I shall just underline one thought. All this equipment, while it requires appropriate organizational arrangement, will provide maximal results in cases where both the capacities themselves are concentration and also those they are called to service. Let me explain: large-scale computer capabilities service a large-scale production complex. Only in such cases is it possible to attain a level of use of computer centers of 300 to 500,000 instructions per second.

This is why, taking into account the possibilities and prospects of production complexes, the USSR Gosplan has decided to direct a large part of its capital (roughly up to 80 percent) toward the development of functioning computer centers and automated control systems so that they will be able to come out on the project mark, have a maximal effect on production, and simultaneously repay the capital spent on them in a short period of time. There is a real basis for such a policy.

The quality of the system, its hardware and software, and the capacity of the established means for processing data determine in the first place the yield of an automated control system. It is this that explains the fact that the indicator "introduction of computer capacity" has become the basic one. Its calculation is based on the character and degree of use of computer technology at the beginning of the planning period. Such an indicator permits the introduction of a standardized method for all kinds of resources and expenditures, including for planned savings.

The efficiency of automated control systems depends directly on their software. Definite movements have been observed in that direction. Computers being received by consumers are supplied with software. It permits more efficient use of the established complex of hardware, establishes control over its functioning, and, finally, permits programming in high-level problem-oriented languages. One must, however, point out one substantive insufficiency. Very often the development and implementation of programs lags behind the accepted and confirmed timeframe for the series activation of computer technology equipment, especially computers.

Planning today must be conducted with consideration for the work on the basis of unified files of data to be retained and processed, the so-called "data bases." Such a "base" embraces all information characterizing the production and economic activity of an enterprise, association, or territorial production complex, and that without duplication and variant forms of the data.

In general automated control systems do not make any sense now without centralization literally in everything. This is true also for the system software. Here too one must support in all ways the initiative of the Ministry of Instrument Building, which together with scientific and planning institutions is creating a centralized store of algorithms and programs. It is concentrated in the leading organization "Tsentrprogrammsistem" [Centralized programming systems] (in Kalinin). This organization, in turn, sells prepared programs and helps in installing them in enterprises regardless of departmental affiliation. Incidentally, the store is expanded not only by the Ministry of Instrument Building, but also by other ministries. Such an arrangement substantially reduces expenditures for support for computers, and, in short, frees their "feeding" with necessary data from many financial expenses and much exacting work.

Now take, for example, the current technical maintenance of computer technology. Nearly always each consumer manages it with his own resources. In sum, this is an unjustified expenditure of material and technical resources. In the Ministry of Instrument Building and the Ministry of the Radio Industry specialized services have been organized to service computer technology. They are supposed to install equipment, see that it is functioning correctly, supplement the programming staff, and take care of training personnel.

It is already possible to say with complete certainty that the directions for the development of computer technology indicated in the Tenth Five-Year Plan, the character and form of its use, the measures taken to provide for an intensive growth of capacity, its provision with the whole set of peripheral equipment, and finally, the system of confirming and accounting planning indicators which has been introduced in practice will provide for the further increase in the efficiency of automated control systems in the national economy.

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CSO: 1870

PLANNERS' LABOR EMULATION

Baku VYSHKA in Russian 4 Nov 76 p 2

/Article by A. Podpalyy, sector manager in the Azerbaijanian Branch of the All-Union State Technological Planning Institute of Mechanization of Accounting and Calculation: "Needed Is an Over-All System. Competition: Experience, Search, Problems. On the Labor Emulation of the Workers of a Planning Institute"/

/Text/ According to the results of the Ninth Five-Year Plan the Azebaijanian Branch of the All-Union State Technological Planning Institute of Mechanization of Accounting and Calculation (VGPTI) has moved to the first place in the socialist competition among the 23 of its branches. This does not mean, however, that there are no shortcomings and unresolved problems in the organization of the planners' competition. Its present conditions do not yet completely take into account all the aspects of the work of the collective's members and of the specific character of the engineering labor.

The collective of our branch develops and introduces plans for the mechanization and automation of calculation on the basis of computing technology. Four steps arise, as it were, along the road to improvement of the organization of calculation: partial mechanization, total mechanization, partial automation, and ASU /automated control system/ Each subsequent step requires a higher level of technological thinking, application of more modern technology and, consequently, also a higher organization of labor. For, even the very perfect technique cannot be effective, if a high level of labor does not correspond to it.

Five years ago the workers of the branch were occupied mainly with the mechanization of calculation , that is, they were working at lower levels. Nowadays, parallel with this, several departments are already developing and introducing ASU subsystems, having mastered the latest third-generation computers on integrating diagrams. Beyond that, a department was created at the branch, which sucessfully participates in developing a new small third-generation electronic computer. It turns out that during the five-year period of time the branch not only has extended its work front, range and topics, but also overstepped its frame, rising over the highest, fourth step. And yet the contradictions between the level of thinking and the organization of work of the planners remained. Take, for example, the sectorial automated control system (OASU)for one of the republican ministries. When several years ago we were to start this work, entirely new for Azerbaijan, few people were able to say how it could be best implemented. Of course, our engineers would travel to other branches for experience, yet all the same they performed that work after the old fashion, as if this were the question about simple mechanization and not OASU. This affected the time of completion of the job. This happened, because the planners did not truly realize that here was a question of a qualitatively new level of labor organization within the ministry. For this it was, first of all, necessary to overcome their habitual ideas about their own work. This did not happen even later, when skilled specialists were added to the departmental staff. As before, inertia in thinking made itself felt and it became a hindrance in pulling the habitual psychology up to the new demands of the day. It is the same contradiction , which bears an immediate relation to productivity of labor, quality of execution of jobs and to other factors depending directly on to what extent they are accounted for in the conditions of socialist competition in the collective.

And, incidentally, they fail to notice such contradictions. This leads to a kind of equalizer in the assessment of the results achieved. And more precisely, the system of competition indicators existing today at the branch works in favor of the middle worker. This is going on, because the right conditions have not yet been created, which would stimulate every worker to achieve high results, principally by better organization of labor.

An organizational and technological basis for the socialist commitments could be provided by the plans of organizational-technical measures directed toward increased productivity of labor and improved quality of planning work, which are made up within the departments and for the branch as a whole. The first such plan was born here more than five years ago. It was approved in the main institute, manifolded and sent to the other branches as a model of good undertaking. Later the plan became total and thereafter consolidated. It became clear that just it should become the basis for the attack on high quality. But the branch was growing, mastering newer and newer volumes of work , topics, computers, fields of economy... The plan barely managed to fix the new changes, and, as it still is often happening, its weakest spot, the execution of what was planned, was not given due attention , although just putting the planned measures into practice required more and more effort and control.

Take, for example, the network schedules. There was no particular need of them, as long as the planners were occupied with mechanization and partially with automation of calculation. The extension of the front of work, development of individual ASU subsystems, compelled to start network schedules directed toward increased effectiveness of the work conducted. But these schedules were used in one department only - by the ASU developers. In the others they limited themselves to merely including them in the plan. But when it came to their introduction, it turned out that it is much easier to work after the old fashion.

A paradoxical situation arose - the plan existed by itself and the real actuality by itself. More precisely, the major part of the plan was being executed. But as regards the organization of the work of the planners themselves, it yielded to changes with difficulty only. The department heads would not understand in any way that they should concern thenselves immediately with these changes. To them the planning work and its organization appeared to be separate, detached spheres. So it happened that the planners occupied themselves with the mechanization and automation of calculation for somebody, breaking old canons and ideas, and at the same time they condoned shortcomings in their own work. The careless treatment of this important factor affected also the conditions of the competition, by-passing it without attention.

A procedure of tallying points in the socialist competition between departments was devised by the branch, foreseeing the percentage-wise fulfilment of the plan, in-time execution of topics, quality of work, labor discipline etc. The place of a department is determined according to the sum of the conventional index units per worker.

It should be noticed, however, that these indicators, firstly, do not take into account the contradiction between the nature of work and its organization, indicated by us above, secondly, do not combine to form a complex reflecting the complicated specific character of the planners' work.

The "Basic trends of development of the USSR national economy in the years 1976-1980" prescribe strengthening of the interest of collectives and workers of scientific institutions in raising the effectiveness of their work. This concerns also us planners in full measure. Without an over-all approach in the matter of perfectioning the calculation, planning and management, it is simply impossible to fulfil this task posed by the 25th CPSU Congress. But such an approach is indispensable not only in the production activity, but also in the organization of socialist competition within the planning organization, whose conditions should be a complete system of measures of moral and material stimulation aimed at raising the efficiency of the engineers' work.

And a total system is just what the institute and its branches need today. This system ought to be created by the joint efforts of the Party, trade-union and Komsomol organizations and the branch management. Out of the multitude of components of the labor competition those basic elements must be selected which will allow every member of the collective to work more effectively, with maximum productivity.

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ENGINEERING AND EQUIPMENT

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SPECIAL CIVIL AVIATION AIRCRAFT AND HELICOPTER EQUIPMENT

Moscow SPETSIAL'NOYE OBORUDOVANIYE SAMOLETOV I VERTOLETOV GRAZHDANSKOY AVIATSII in Russian 1972

[Book by A. G. Gamulin and Ye. V. Sofronov, second edition, revised and enlarged]

[Excerpts] Title Page:

Title: SPETSIAL'NOYE OBORUDOVANIYE SAMOLETOV I VERTOLETOV GRAZHDANSKOY AVIATSII (Special Civil Aviation Aircraft and Helicopter Equipment)
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Annotation:

The book gives the operating principles, installation and features of the operation of special equipment of aircraft and helicopters in civil aviation. A description is given concerning electrical equipment, aviation instruments, navigation and automatic control systems and oxygen equipment; the book contains brief information on systems of radio communications, radio navigation and radar in modern aircraft.

The exposition of the operating principles of installations, instruments and systems is based on the method of Professor L. M. Malikov, which is widely used in civil aviation educational institutions. Figures 290; tables 10.

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CENTRAL AEROLOGICAL OBSERVATORY RESEARCH, PRACTICAL WORK

Moscow TSENTRAL'NAYA AEROLOGICHESKAYA OBSERVATORIYA in Russian 1976 pp 3-16

[Article by G. I. Golyshev and A. Kh. Khrgian: "The Central Aerological Observatory and Some Results of Its Work"]

[Text] When summing up the work of the TsAO [Central Aerological Observatory] on the day of its 30th anniversary and the anniversary meeting of its Learned Council, we should recall that the authors have already considered this subject once, a few years ago in the anthology "Aerologiya -- 1970" [Aerology -- 1970], which was prepared by a collective of associates at the Observatory for the 50th anniversary of the USSR Hydrometeorological Service. The significance of certain projects and conclusions, both the most important ones and lesser ones, becomes clearer over the years. As the edifice of aerology grows its harmonious structure and perfection depend increasingly on the stability of the foundation laid in earlier years.

Thus, time has made it possible to supplement the concluding part of the article in which we attempted to present, in addition to the most important result, some ideas on the future prospects for the development of aerology.

In the present article the authors have not set out to expound the content of the basic projects of the collective at the Central Aerological Observatory. This is clearly too large a task. We have only set forth the most significant stages in the activity of the TsAO. Our narrative cannot exclude the subjective factor, of course, but we have tried to represent here all historical aspects of the development of the Central Aeorological Observatory.

The Central Aerological Observatory was formed on the basis of the Aerological Observatory of the Central Institute of Forecasts. It was created in 1940 at the initiative of P. K. Yevseyev, O. G. Krichak, S. S. Gaygerov, N. Z. Pinus, and several other comrades. Its activity was based on the use of assorted aeronautical means for different experimental projects in the vast laboratory offered by the atmosphere. One of the subjects of the first period of its work was the transformation of moving air masses; the physics and microphysics of clouds was another, and atmospheric fronts was a third.

In addition, the Aerological Observatory began studying the upper layers of the atmosphere from the very start of its work. High-elevation flights by substratostats played an especailly important part in this work. The participants in this work included O. K. Krichak, S. S. Gaygerov, N. Z. Pinus, V. A. Belinskiy, P. F. Zaychikov, A. M. Borovikov, V. D. Reshetov, and various other associates of the Observatory. The aeronautical part was headed by M. N. Kanishev. The flights were performed by aeronauts A. A. Fomin, G. I. Golyshev, S. A. Zinoveyev, A. F. Krikun, B. A. Nevernov, and P. P. Polosukhin.

When the Great Patriotic War began in 1941 and many associates left for the front the flights were stopped. During this period scientifi c work at the Observatory followed two lines: development of new methods of aerological observations and designing instruments and making operational observations for the weather service of the air defense forces. All the work was done by the small number of associates who remained in Moscow. It must be said that this collective did well: observations did not stop for a single day, even though there were difficulties with retrieving radio sondes and repairing them for repeated use. Aircraft sounding in those days meant great risk and danger! Nonetheless, it was done regularly and produced very important operational and scientific material.

The most significant thing done at the Observatory in the war years must be considered to be the application, for the first time in science, of radar equipment to measure wind at high altitude. This project was done by V. V. Kostarev, R. O. Tydel'skaya, and G. I. Golyshev in the spring of 1943 and was followed by establishment of the world's first network of radio wind observations.

In 1943 the question arose at the Main Administration of the Hydrometeorological Service of where to set up a new national aerological center (the Institute of Aerology of the Main Geophysical Observatory had been destroyed by fascist troops during the blockade of Leningrad). It was decided, after discussion at a meeting in the office of Main Administration chief Ye. K. Fedorov, to establish such a Central Observatory in Moscow.

At the same time it was determined that the TsAO should be first of all a scientific-methodological center responsible for aerological observation in the country, but also a scientific research center with broad opportunities for conducting experiments right in the atmosphere using the latest aerological research means. These were the two chief tasks given to the TsAO. They are its main tasks today as well, and will probably remain so in the future.

In 1944 aerological investigations on a nationwide scale began to be developed. This opened up broad opportunities for the TsAO. The staff of the Observatory was enlarged and it was given new equipment: radar sets, a fleet of aircraft, and so on.

Further growth of the Central Aerological Observatory and new paths and prospects for its development were tied to the end of the war and the

beginning of peaceful building. Since 1946 the TsAO has participated in major investigations of the physics of cosmic rays, providing flight support for the projects headed by S. N. Vernov. S. I. Vavilov, president of the Academy of Sciences USSR at that time, gave substantial support to the TsAO.

In the postwar years the TsAO played a very large part in rebuilding our country's aerological network too. In 1946 the radio wind sounding network already had 22 stations, roughly 100 radio sounding stations, and 300 piloted balloon points. It was at this time that the TsAO began to develop as the all-Union methodological center in the field of aerology. A division for methodological direction of the network was set up at the Observatory under the leadership of A. T. Bergun. Very painstaking work to prepare manuals and guidebooks for the aerological network was begun.

After the war the old associates returned to the Observatory: N. Z. Pinus, S. S. Gaygerov, A. S. Masenkis. Joining them were A. Kh. Khrgian, I. I. Gayvoronskiy, and V. G. Kastrov. The collective of the Observatory was strengthened and experimental investigations of the atmosphere began to develop broadly. The range of topics for study which had been made before the war was significantly broadened. A good fleet of balloons was built at the Observatory, permitting prolonged high-altitude flights. Comprehensiveness, which developed especially in balloon observations, became a distinguishing feature of the scientific work.

This was the time (1947) when automatic balloons were built and began to be used. Note that the schemes and some technical concepts related to their design and flight had long been known. Today their use seems quite simple, but at that time it was very difficult to persuade many scientific workers that an automatic stratospheric balloon in the air could be detected, its flight tracked, and then that it could be landed without damaging the scientific instrumentation, and further that all this could be done rather quickly.

In 1948 the world's first automatic stratostat, carrying a load of 125 kilograms, was lifted from the airfield at the Observatory to an altitude of roughly 22 kilometers and then brought down to a normal landing. After this similar flights became routine for the TsAO.

The method and design of automatic stratostats developed by G. I. Golyshev, T. M. Kulinchenko, and A. S. Masenkis at TsAO (author's certificate No 11948) found broad application later for investigation of the stratosphere and for numerous special projects carried out under the programs of the Observatory and other departments.

In the period 1970-1975 alone 121 flights in TsAO automatic stratostats were made with an average altitude of ascent of 28 kilometers. They were used in a series of investigations conducted by associates of the State Optical Institute imeni S. I. Vavilov.

In 1947-1948 the work on study of clouds and their microphysics, which had been begun before the war, was continued and broadened. At first

this research was conducted by A. Kh. Khrgian and A. M. Borovikov; Ye. G. Zak participated later. Then the project was joined by V. Ye. Minervin and I. P. Mazin and extremely broad airplane and balloon investigations of clouds were organized. As a result the TsAO gathered the world's only (in terms of completeness, coverage of the different geographical and climatic regions, soundness, and quality) experimental material on clouds. At the same time there were also many studies of the microstructure of clouds, their water content and phase structure, the spectra of drop sizes, and the like; no similar research was being done abroad. This material was used subsequently, at the TsAO and at many other institutes, for study of atmospheric optics, ice formation on aircraft, and the theory of the formation of precipitation. Parallel to this the macrostructure of large frontal cloud systems, thunderheads, and, especially, layers of St-Sc clouds were studied and described in detail. The structure of the latter, it was learned, is crucially important for operating aircraft and compiling weather forecasts. This gives the research done at the TsAO on fluctuations of these layers, wave structure, condensation mechanisms in them, and the like direct and substantial practical significance.

A new stage in the study of clouds, characteristic of Soviet and, in recent years, foreign work, joins investigation of the macro- and micro structural characteristics of clouds on the experimental level (observations in flight) and in the theoretical area. For example, theoretical work undertaken in recent years at the TsAO has been devoted to calculating supersaturation and the rate of condensation and coagulatory growth of cloud and precipitation drops with due regard for the vertical movements and other macrophysical characteristics of clouds.

Cloud research laid the foundation for developing active methods of influencing clouds and precipitation. The Observatory entered this area in 1948 under the direction of I. I. Gayvoronskiy. TsAO workers gave primary attention to the search for methods and reagents and working out procedures for using them under natural conditions. Significant efforts were directed to influencing hail and thunder clouds. This research included lab tests in a cloud chamber and study of the action of various substances, the yield of nucleii, methods of regenerating them and analyzing their activity under different temperature conditions. With participation by N. O. Plaude and L. P. Zatsepinawork was done on techniques of seeding natural clouds with carbon dioxide, silver iodide, and other reagents taking advantage of natural factors, in particular wind shifts. At the same time successful work was being done on the design of active aerosol generators and antihail rockets.

A. D. Solov'yev proposed and tested hygroscopic substances whose effectiveness depends greatly on weather conditions and fog dynamics to influence fog.

In the last decade the basic efforts of science in this area have been directed to the problem of fighting hail in different regions of the USSR.

These projects have been broadly supported by the Government of the USSR. Climatological material was used in preparation for the test actions and radar observations of hail-prone clouds insured their success.

The method of hail protection for valuable agricultural crops which has been developed at the TsAO using specially developed and industrially incorporated antihail rockets has gone through production testing and been used for several years in the Moldavian SSR and the Crimea. In 1974 the TsAO antihail expedition in Moldavia carried out hail control over an area of 540,000 hectares. With assistance from the Government of the Moldavian SSR and the Central Committee of the Communist Party of Moldavia an antihail service has been set up in the republic and each year brings Moldavian agriculture an income on the order of 10-15 million rubles.

A new method of breaking up convective clouds using heavy insoluble powders was developed and tested extensively at the TsAO; it was successful in a number of cases. Tests were also made on weakening the electrical field of thunderheads, which is dangerous to aircraft.

The use of radar equipment to detect and track heavy rain clouds also belongs to the postwar years. V. V. Kostarev, who was in charge of the development of this method, gave persuasive proof of its effectiveness and great scientific significance. Already in the early stages of this work the TsAO successfully provided air shows in Moscow with radar data on heavy rains and thunderstorms. Later a radar storm warning network was set up; many associates at the TsAO made large contributions to its organization. In addition to giving airports storm warnings this network made it possible to carry out a series of interesting and important projects related to study of the atmosphere. The radar equipment at the TsAO today is used to study the fine structure of the wind, turbulence in clouds and precipitation, and to assess favorable conditions for active influences on hail clouds.

A great deal of effort has been devoted to analysis and improvement of methods of radar measurement of precipitation over large areas. Detailed data on the spectra of the sizes of drops of precipitation and careful comparison of radar observations with data from the rain gaging network were needed to solve this problem. The use of two-wave radar opened the greatest prospects. The problem of measuring precipitation in mountain country also led to development of a new method: observations of a standard target.

The work of the TsAO in the field of using radar to study the atmosphere, which was carried on with the active participation and under the direction on V. V. Kostarev, was begun during the Great Patriotic War and developed by V. V. Kostarev's students A. I. Beznis, A. A. Chernikov, A. G. Gorelik, Yu. V. Mel'nichuk, and others, making it possible to conduct a whole series of long-range observations of the state of the atmosphere and providing researchers with a good modern means for continuously monitoring the state of the atmosphere.

The broad cycle of investigations directed by N. Z. Pinus at the TsAO right from the beginning was devoted to the study of turbulence in the free atmosphere. Its greatest contributions were to experimental study of the distribution of turbulence in space, analysis of the fine structure of its spectra, and its dependence on stability conditions and wind in the atmosphere. A number of "turbulence sondes" and instruments to observe vertical and horizontal wind pulsations were built. Using them, in 1964 a special "flying laboratory" was built, primarily for the study of turbulence. As the ceiling of modern aviation has been raised in recent years it has been possible to apply these observations to study of the stratosphere as well.

They have made it possible to describe the processes of the origin and attenuation of turbulence, its intermittancy in space, the assymetry of distribution of ascending and descending velocities, and so on. Of course, the typical, comparatively narrow zones of strong turbulence above mountains and near the jetstreams attracted a great deal of attention. The study of clear-sky turbulence unassociated with visible clouds proved most important for aviation, especially when flying in the stratosphere. It was possible to draw up a special table of signs of this turbulence. The table is used in practice and plays an important part in flight organization in the stratosphere and selecting air routes. The dependence of clear-sky turbulence on the stability of general currents in the atmosphere is still today an important problem which needs further study.

In the theory of turbulence a significant discovery was the dependence of the spectra of turbulence on the action of buoyancy forces (thermodynamic stability). A new stage in the study of turbulence was also related to investigation of the recently discovered mesoscalar phenomena and waves which depend (unlike oscillations of small scale) on Coriolis force. They are important in forecasting. It appears that the cause of the generation of numerous forms of atmospheric turbulence must be sought in the formation of such waves.

The study of the dynamics (velocities, development, gusts, spectra, and so on) of powerful atmospheric convection, which was directed by S. M. Shmeter, constituted a special chapter in atmospheric research at the TsAO. This was the first theoretical and experimental study of the dependence of convection and its clouds on the shifting of the wind. It was proved experimentally that clouds can penetrate the tropopause and carry a large amount of air and water vapor into the stratosphere, substantially enriching these usually very dry layers of the upper atmosphere. Very recently, in 1972-1974, experimental investigation of convection and clouds in the tropic zone has permitted a better understanding of their mechanism as a source of energy for atmospheric movements of the largest scale.

A new and very productive stage in TsAO activity was tied to the beginning of rocket research. This was a very large step forward in the development of meteorological science. The method of rocket sounding of the atmosphere began to be developed at the TsAO in 1949 in a special division

under the direction of V. A. Putokhin. The first Soviet meteorological rocket, the MR-1, was launched as early as October 1951. From the first days G. A. Kokin, N. S. Livshits, Ye. A. Besyadovskiy, M. N. Izakov, A. M. Kasatkin, and other associates of the TsAO were involved in this project.

Our first meteorological rocket, the MR-1, was a returning model. Its use was the first time that both the instrumentation and the power plant were returned to the launch area. This made it possible to greatly step up the number of launches. There were rockets and sets of instruments that made two and three ascents in the high layers of the atmosphere.

The launching of these rockets led to receipt of the first data on air temperature and density and wind up to altitudes on the order of 100 kilometers. These absolutely new data on the structure of the upper atmosphere were a major achievement by the TsAO.

In 1957 the MR-1 was replaced by the lighter, more convenient MMR-1, which could ascend about 50 kilometers. An important feature of TsAO rocket methods (including those using the latest rocket models, the MMR-06 and MMR-12, with higher ceilings) was direct measurement of air temperature and pressure during flight. The development of the theory of the instruments used for this purpose required considerable effort from TsAO associates and the organization of extensive laboratory tests. The parachute designed to save the nose of the rocket containing the instruments (and later also the special dipole-reflectors dropped from the rocket) made it possible to organize observations of the wind too during the rocket's descent. Meteorological rockets were ordinarily "loaded" with other instruments for observation of solar radiation (in particular the oxygen line of the solar spectrum $L\alpha$, the X-ray part of the spectrum, and others), corpuscular radiation, and the mass spectrums which characterize air composition. Diagrams of the typical distribution of wind and temperature (up to 80 kilometers altitude) have already been drawn for some points in the USSR using the numerous rocket ascents. Ionization manometers and later mass spectrometers (omegatron type) made it possible to continue the temperature curve to 180 kilometers and prove, for example, that the polar thermosphere is much colder during the winter ($T \cong 800°$) than various earlier "models" of the atmosphere had assumed. Also fundamentally important was the detection and analysis of the concentration of water vapor in the mesosphere and even in the thermosphere, proving that the influx of H_2O models there is significant and exceeds its photolysis. In the very near future an interesting problem will be resolved: does vapor enter the thermosphere from below or above (in the form of solar protons which transform into H)? The observations of corpuscular radiation which have been made (of solar or cosmic origin) are exceptionally important for working out a modern theory of the ionosphere and its pulsations, a theory which must add to classical notions of "simple layers" arising through the electromagnetic radiation of the sun.

Aerology today faces the question of the need for rocket data and the problem of how to include these data in weather service work and making

forecasts for the troposphere. If these matters are resolved there will be a question of how to set up a rocket sounding test network in the USSR.

The results of rocket sounding, like the data from the vast Soviet and foreign network of radiosondes, enabled S. S. Gaygerov and D. A. Tarasenko to make a considerable contribution to working out the standard atmosphere. It was formerly important mainly as the basis for figuring aviation instruments and setting standards for scheduled airliners. Today, when many meridional cross-sections of troposphere and stratosphere temperature have been constructed at the TsAO and variations of temperature in different latitudes have been considered, development of the standard atmosphere has acquired the much broader nature of aeroclimatic research. Its global character was even more emphasized when data on wind were processed parallel to it. Closely tied to the temperature field, wind data made it possible to describe both the average distribution of wind velocities and seasonal change in the westerly and easterly circumpolar vortices. This change determines the basic features of the very important phenomenon of general atmospheric circulation.

Extensive statistical investigations of the variability and changes in meteorological elements, including the altitude of isobaric surfaces (the changes which determine the formation of waves and vortices in the atmosphere) have been conducted at the TsAO by V. D. Reshetov and his associates. This work is important for weather forecasting and for planning the world network of aerological observations.

About 1951 the Observatory began to take part in studies of the polar regions; since then the participation has become very significant. The Arctic Scientific Research Institute agreed from the start that TsAO could take part in setting up aerological observations on drifting stations. The first observers there were P. F. Zaychikov, V. K. Babarykin, and A. Ye. Shchekin, who had the honor of carrying out the first aerological research on drifting ice. Since that time the TsAO has regularly organized aerological observations (and scientific development of their data) on drifting stations in the Arctic, and later also Antarctic. Important contributions to this work have been made by A. Ye. Shchekin, S. S. Gaygerov, V. I. Shlyakov, G. A. Kokin, A. M. Borovikov, and other TsAO associates. The TsAO also deserves credit for organizing regular aerological investigations on numerous marine expeditions in all latitudes.

During the time of the International Geophysical Year and the International Year of the Quiet Sun rocket sounding was widely developed. It was possible to organize it at different points of the globe. The data from hundreds of rocket launches, obtained thanks to the enormous labor of the TsAO collective, the Arctic observatory on Kheis Island, and our ships the "A. I. Voyeykov" and the "Yu. M. Shokal'skiy," were the basis for studying many entirely new features of the structure and dynamics of the lower and upper atmosphere.

The next point we should take up is the TsAO's leading role in development and redesigning of the aerological network. This was a direct contribution

by the Observatory to the weather service. In our country today there are roughly 223 regularly operating temperature-wind sounding points. Insuring that such a number of stations operate continuously and well is an important, difficult matter. Significant contributions here have been made by A. T. Bergun, V. D. Reshetov, and the entire collective of the scientific-methodological division of the TsAO, while the work of B. G. Rozhdestvenskiy, A. D. Trebukhin, V. S. Khakhalin, M. V. Krechmer, O. V. Marfenko, and other associates of the Observatory was basic in building new technical means for the aerological network. L. A. Aleksandrov deserves great credit for introducing the latest equipment in the aerological network.

The technical equipment of the aerological network has changed greatly over the years. Everyone today has already forgotten the optical theodolites that were replaced by radio theodolites and radar sets. Several new types of radiosondes have supplanted the tooth-comb type radiosonde which served for many years. In recent years the TsAO, with a number of industrial enterprises taking part, has built the highly sophisticated RK3-5-Meteorit OKA-3 system for comprehensive wind and temperature sounding of the atmosphere. Owing to the special structure of the response signals this system has great operating range and precision of coordinate determination. The system is complemented by the method of automatic processing of sounding data, which converts them directly into digital form for transmission to computing centers and to all subdivisions of the weather service.

Since 1965 work has begun at the TsAO to apply lasers in the study of various atmospheric phenomena. Workers at the TsAO have given special attention to observation of the polarization of a dispersed ray. Characteristics of the dispersion of a laser beam by different particles -- dry and wet nuclei, drops of water, and others -- have been considered theoretically. V. M. Zakharov, O. K. Kostko, V. I. Shlyakhov, and A. Ye. Tyabotov conducted a series of tests of laser observations of clouds, fog, and polluted layers of the atmosphere, both from the ground and from aircraft. The effect of below-cloud layers (for ground observations) of aerosols not noticeable to the eye proved significant for interpreting the polarization data of the laser observations. The latter, with observation from above, make it possible to identify the cloud against the background of the particular underlying surface. In addition, it was also possible to evaluate the attenuation factor α of the beam and even the water content of certain types of clouds with low optical density. The factor α proved noticeably dependent on the moisture of the below-cloud layer. Tests of laser observation of the land and sea surface from an airplane (in particular, of sea waves and the direction of their propagation) also proved successful.

In the field of actinometry the TsAO began developing observations of solar radiation and emission in the free atmosphere as early as 1948, attempting to approach the study of the radiation balance of the atmosphere as a whole and its radiant heating and cooling. A ballon was used for this purpose first, then later an airplane which would rise to 6-7

kilometers came to be more widely used. An important step forward was the development and improvement of the actinometric probe ARZ-TsAO, in which G. N. Kostyanoy and V. I. Shlyakhov participated. This made it possible to carry observations to much greater altitudes than airplanes could. The ARZ probe was praised highly when compared with foreign devices of this type. Parallel with this, the TsAO radiometer offered extensive opportunities to investigate the radiation balance of the clouds and study their radiation cooling (which reached 28 degrees in 24 hours) and warming (up to 17 degrees in 12 hours). These observations showed that the contribution of radiation processes to the heat balance in a cloud, and probably also in the condensation process, is very significant. It appears to be even more important than assumed earlier on the basis of purely theoretical assessments.

Observations using ARS probes also make it possible to evaluate the magnitudes of the ascending and descending streams of radiation in the whole atmospheric layer of the Earth to the level of 10 millibars, which is roughly 30 kilometers.

Conclusion

In summarizing, the authors feel it is possible to draw the conclusion that the collective of the Central Aerological Observatory, which has become a first-class scientific research institution over the years, performed a number of important investigations and projects during the period we are discussing. It was always on the front lines of Soviet science, taking active part in the development of the Hydrometeorological Service and performing many special projects in the interests of the national economy and national defense. Answering the basis question of how well the collective has handled the tasks it was given when the TsAO was founded in 1940, the authors consider it possible to answer without any hesitation -- they have done well!

1. Through all its years the Central Aerological Observatory has been, is, and remains today the scientific-methodological center responsible for the state of aerological measurement in the country and its development. The authors note once again with satisfaction that the transition to the RK3-5-Meteorit OKA-3 atmospheric radio sounding system developed by the TsAO together with a group of industrial enterprises has already been carried out at some 60 aerological stations in the USSR and by 1980 will be completed at all 223 aerological stations, guaranteeing excellent measurement of the state of the atmosphere to altitudes of 35-40 kilometers. This insures the modern forecasting service of the aerological data it needs and supports various investigations in the field of atmospheric physics. The radio sounding system being introduced by the TsAO according to its own technical specificationssurpasses similar foreign systems.

2. In the process of its development the collective of the Observatory has always directed its activity with an eye to the practical needs of the Hydrometeorological Service of the USSR and special problems related

to the interests of the national economy and national defense. In recent years the collective of the Observatory has greatly enlarged its scientific potential and now has 15 doctors of sciences, 60 candidates of sciences, and 300 scientific associates and engineers who participate actively in scientific research. A creative and enterprising atmosphere which favors the continued development of Soviet aerology has been created in this smooth-working collective.

3. In past years, especially in 1965-1970, the necessary laboratory and experimental facilities for major scientific work have been built; they include a computing center with a computer, flying laboratories based on IL-18 planes, a whole series of up-to-date laboratories, experimental production workshops, modern radar equipment and laser sounding devices. The TsAO uses a series of experimental bases in the region near the city of Ryl'sk, the Moldavian SSR, on Kheis Island, near the magnetic equator in India, on Kerguelen Island (in cooperation with French scientists), and in Antarctica.

All this permits us to say that the second task laid down when the TsAO was founded has also been performed well.

The scientific research center of the TsAO has broad opportunities to continue and elaborate experiments in the atmosphere up to very great altitudes. The basic laboratory for these experiments is the Earth's atmosphere in its different latitudes and most varied states.

When speaking of the outlook for the development of work at the TsAO in the immediate future, we should consider the transition of the Observatory collective in 1975-1980 to comprehensive investigations of large-scale atmospheric processes, their physical mechanisms, and their evolution in time and space. This process is timely and adequate preparations have already been made. The refinement of observation methods and investigation of lower and upper atmospheric phenomena to secure a clearer understanding of their future development can be combined in this problem.

Considering the complexity of this work it would be expedient for this task to become the principal one for all divisions of the Observatory and to be handled in creative cooperation with other institutions of the Hydrometeorological Service and with the Academy of Sciences USSR. This method of work will preserve the TsAO traditions, the traditions of an organizer and active creative participant in collective solution of the complex scientific problems of the atmosphere viewed as a whole.

In familiarizing the participants in the meeting of the TsAO Learned Council with this article, the authors will be sincerely pleased if it helps give an idea, even in general, of the road traversed by the collective of the TsAO and makes it possible to strengthen further the creative ties between this collective and its respected colleagues, students of the atmosphere.

11,176
CSO: 8144/0494

OFF TO ANTARCTICA IN SEARCH OF BACTERIA

Moscow PRAVDA in Russian 24 Nov 76 p 4

[Article by V. Bardin, Candidate of Geographical Sciences, Bashkiriya diesel boat, Indian Ocean]

[Text] The diesel [motor] boat, Bashkiriya, is one of the vessels of the 22d Soviet Antarctic expedition, on its way to the Antarctic Continent through the Indian Ocean. A routine radiogram from our non-staff correspondent on board the Bashkiriya reports on a little-known direction of research in Antarctica.

The conception that Antarctica is a microbiologically sterile continent was refuted long ago. Here, in the mountains and snow, a wide diversity of microorganisms has been discovered. Even in samples extracted from a snow mine at the South Pole, bacteria have been found. How did they reach the central, seemingly completely lifeless region of the sixth continent? Most likely, they were brought here with streams of air. Theoretically, we cannot rule out their being carried in with cosmic dust.

The scientists in the laboratory of cosmic microbiology of the Institute of Microbiology, USSR Academy of Sciences, who are investigating the problem of effects of extreme factors on microorganisms, were interested in the possibility of natural preservation of bacteria on the polar continent. Is it possible that microorganisms brought to Antarctica have been preserved for many thousands of years deep in the ice, in a deep-frozen state? For it has been proven experimentally that even the rigorous conditions of outer space do not preclude the possibility of survival of protozoan microorganisms. But we still do not know how long they can remain in an anabiotic state. Antarctica offers unique opportunities to answer this question. There are compressed layers, formed tens and even hundreds of thousands of years ago, deep in the ice, the thickness of which is up to 4 km.

The team of scientists headed by Academician A. A. Imshenetskiy decided to conduct field investigations, to collect samples of snow and ice for microbiological investigation of various layers of the glacial surface of central Antarctica. They selected the Soviet station, Vostok, which is

the coldest point of our planet, having an absolute minimum temperature of 88.3°.

Technically, the most difficult task in store for the investigators was to preserve sterile conditions to rule out the possibility of extraneous microorganisms in the samples taken from the ice. The scientists of the Institute of Microbiology, USSR Academy of Sciences, in collaboration with the Arctic and Antarctic Scientific Research Institute and Leningrad Mining Institute, have been working on this problem for several years. A special, mobile, microbiological drilling laboratory was developed on the chair of technology and techniques for well drilling of the Leningrad Mining Institute, and a unique device was developed for collecting samples, under sterile conditions, from ice extracted at different depths.

Drilling for the purpose of microbiological research began during the 20th Soviet Antarctic expedition to the Vostok Station. In two summers, drilling advanced to 207 meters, and more than 500 microbiological samples were collected, which were then delivered to Moscow and submitted to comprehensive investigation.

As a result of these investigations, for the first time, diverse forms of microorganissms were isolated from the deep layers of the glacial surface of central Antarctica. The most ancient of the "revived" specimens were extracted from a depth of 197 meters. The age of this layer of ice is estimated at about 8,500 years.

Sabit Abyzov, candidate of biological sciences and chief scientists of the Institute of Microbiology, USSR Academy of Sciences, is in charge of the microbiological studies at the Vostok Station. There is more drilling to be done into deeper ancient layers of ice, in an attempt to revive more ancient microflora after many thousands of years in a dormant state.

10,657
CSO: 1870

M.G. GAPUROV ADDRESSES TURKMEN ACADEMY OF SCIENCES MEETING

Ashkhabad TURKMENSKAYA ISKRA in Russian 20 Nov 76 pp 1-2

[Speech by M.G. Gapurov, first secretary of the Turkmenistan Communist Party Central Committee at 19 November 1976 jubilee session of Turkmen SSR Academy of Sciences General Assembly devoted to 25th anniversary of the formation of the Turkmen SSR Academy of Sciences: "Service of the People--the Scientists' Lofty Duty"]

[Text] Dear Comrades!

Today is a great and joyous day in the life of the scientific community and all working people of the republic--the Turkmen SSR Academy of Sciences--the headquarters of the republic's scientific thought--is 25 years old.

Permit me on behalf of the Turkmenistan Communist Party Central Committee, the Turkmen SSR Supreme Soviet Presidium and Council of Ministers, and all the republic's working people to warmly and cordially congratulate the collective of the Academy of Sciences, scientists, and all scientific workers on the great holiday--the 25th anniversay of the Turkmen SSR Academy of Sciences.

These jubilee festivities, Comrade M.G. Gapurov emphasized, are taking place at a time when the working people of our entire boundless multinational motherland are living and working under the ineradicable impression of great and important events of historic significance for the further flourishing of the economy and culture of the Soviet Union, the relaxation of international tension, and the creation on our planet of a sound political climate providing real prerequisites for the triumph of the forces of wisdom and progress and for the strengthening of peace and fruitful cooperation among all peoples.

Our country and all our friends on earth have just ceremonially and joyously celebrated a great holiday of the Soviet people and all progressive mankind --the 59th anniversary of the Great October Socialist Revolution. The festive celebrations took place under the banner of the working people's

struggle for fulfillment of the magnificent designs outlined by the historic decisions of the 25th CPSU Congress.

The CPSU Central Committee October Plenum and the USSR Supreme Soviet Fifth Session of the Ninth Convocation were held on the eve of this portentous holiday. The vivid, meaningful, program speech of Comrade L.I. Brezhnev, general secretary of the CPSU Central Committee and outstanding political and state figure of our time, at the CPSU Central Committee October (1976) Plenum summed up the results of the party and people's great amount of creative work following the 25th CPSU Congress, revealed comprehensively and in depth the paths for the further implementation of the decisions of this forum of communists of the Country of Soviets, and provided a comprehensive description and political evaluation of the 10th Five-Year Plan and the next economic year. The propositions and conclusions set forth in Comrade L.I. Brezhnev's speech at the plenum and the magnificent dimensions of the 10th Five-Year Plan approved by the country's highest organ of state power demonstrate with new force the consistency and purposefulness with which our party and its Leninist Central Committee are implementing the historic decisions of the 25th CPSU Congress.

The Turkmenistan working people, like the entire Soviet people, warmly approve and unanimously support the wise domestic and foreign policy of the Communist Party's Leninist Central Committee and its Politburo headed by Comrade L.I. Brezhnev and are laboring enthusiastically on implementing the magnificent plans of communist building and making their worthy contribution to this nationwide cause.

Then Comrade M.G. Gapurov dwelt in detail on the concrete deeds of the working people of the Turkmenistan cities and villages regarding fulfillment of the plans and adopted socialist pledges for 1976.

The scientific workers of Soviet Turkmenistan, Comrade M.G. Gapurov continued, are also making their worthy contribution to the solution of the tasks of economic and cultural building confronting the republic. Implementing Lenin's instructions concerning strengthening the alliance of science and practice and in close cooperation with the party, soviet, and business management organs and with the USSR Academy of Sciences and the scientists of the fraternal republics, they are working in the most important directions of scientific-technical progress and the development of the national economy.

That is why the jubilee celebrations on the 25th anniversay of the Turkmen SSR Academy of Sciences are gratifying to all of us and are a holiday not only of the scientists but of all working people of the republic.

The creation of the Turkmen SSR Academy of Sciences, as also the academies of sciences of the fraternal republics, is a result of implementation of the Communist Party's wise Leninist national policy and its constant paternal concern for the development of the economy and the intellectual and

spiritual growth of the national outlying areas of a formerly backward country. This concern has been displayed since the very first years of Soviet power and was specifically expressed both in the rendition of daily practical assistance in the training of skilled scientific cadres from the local population and also in the dispatch to us of an entire pleiad of outstanding scientists of the country to conduct scientific research and create the necessary base in the republic for the organization of its own scientific center.

Numerous USSR Academy of Sciences' expeditions to various regions of Turkmenistan in the 1920's and 1930's made an ineradicable mark in the history of Soviet Turkmenistan. The country's top scientists--academicians A.Ye. Fersman, D.I. Shcherbakov, V.V. Bartol'd, I.M. Gubkin, A.N. Samoylovich, Ye.N. Pavlovskiy, N.I. Vavilov, and many others--whose names are inseparably connected with the republic's history, study of its natural wealth, and the development of its production forces, economy, and culture, actively participated in this noble work.

The vast amount of preparatory work in those years, distant, but unforgettable in the popular memory, created the conditions for the formation in Ashkhabad in 1941, on the eve of the Great Patriotic War, of the Turkmen branch of the USSR Academy of Sciences, which came to be headed by the eminent Soviet scientist Comrade D.V. Nalivkin. The branch collective honorably made as big a contribution as possible to the victory over fascism and, subsequently, to the cause of the restoration and further development of the republic's national economy and undertook systematic and purposeful work to train scientific cadres.

Following a decree of the Soviet Government, in June 1951 the Turkmen branch of the USSR Academy of Sciences was transformed into the Turkmen SSR Academy of Sciences.

This event has gone down in the history of Soviet Turkmenistan as an important landmark on the path of the building of a new life and as a convincing indicator of the flourishing of the republic's economy and culture and of the great possibilities for the further comprehensive development of scientific research in many spheres of scientific knowledge.

The Turkmen SSR Academy of Sciences became an outpost of Soviet science in the East of the country. It is made up of scientists representing many of our country's nationalities who are working fruitfully in a fraternal community.

The Turkmenistan Academy of Sciences has considerably broadened the scale of research and sphere of its activity over the past 25 years. New scientific centers, including the leading establishment for study of the country's desert territories--the Institute of Deserts--and also the Institute of Physics of the Earth and the Atmosphere and the Institute of Physiology and Experimental Pathology of the Arid Zone, have been

created as a part of it, and those of botany and zoology, economics, and others have become independent institutes.

Approximately 2,000 people, including 828 scientific workers, among whom are 36 doctors and 390 candidates of sciences, presently work in Turkmen SSR Academy of Sciences' establishments. It has 21 academicians and 27 corresponding members of the Turkmen SSR Academy of Sciences.

Alongside fundamental research, this numerous collective of highly skilled scientific workers is also developing urgent national economic problems of great significance for the further upsurge of the republic's economy and culture and for implementation of the party's social program.

In the Ninth Five-Year Plan the Turkmenistan Academy of Sciences participated in the solution of a number of problems of the all-state plan of scientific research. The scientists made a comprehensive study of the plutonic structure, composition, and development of the earth's core and upper crust for the purpose of determining the natural patterns of the formation and location of useful minerals. The physicists of the academy synthesized new semiconductor materials which are being extensively employed in technology. There was also a solution to a number of important questions on forecasting radio communications at long and superlong distances.

The collective of the Institute of Deserts drew up recommendations regarding the assimilation of 150,000 hectares of farming land through agricultural and forestry crops. Great successes were scored by Turkmen SSR Academy of Sciences' specialists in the acclimatization of herbivorous fish. The young fish cultivated in our ponds are transferred for breeding to the internal basins of other Central Asian republics and also the Caucasus, the Ukraine, and many foreign countries.

Good results have also been achieved in certain other important directions.

Turkenistan's scientists are moving out increasingly broadly into the all-Union and international arena. In recent years they have come to participate actively in many major scientific forums.

The Communist Party and the Soviet Government have evaluated the results of the Turkmen SSR's Academy of Sciences and its contribution to the development of all Soviet science at their worth. The motherland has conferred on it its high government award--the Order of Friendship of the Peoples.

This high appreciation is inspiring Turkenistan's scientists to new scientific quests and makes it incumbent upon them to further develop, extend, and improve scientific research on a higher qualitative foundation. All the essential conditions for this are to hand.

The Communist Party and Soviet Government are doing everything to insure that science in each republic develop at an accelerated pace and multiply its contribution to the solution of urgent national economic tasks. The Soviet state is allocating an enormous amount of capital for the development of science and for strengthening its material base.

The Turkmenistan Academy of Sciences receives constant, comprehensive, and inestimable help and support from the headquarters of Soviet science--the USSR Academy of Sciences--its Presidium, and leading scientists in various branches of knowledge and from the academies of sciences of the fraternal union republics.

Further vivid evidence of this is the participation in our jubilee festivities of a highly representative delegation of the USSR Academy of Sciences headed by its president, Academician Anatoliy Petrovich Aleksandrov, outstanding scientist and major organizer of science and three times Hero of Socialist Labor. It is made up of academicians Aleksandr Vasil'yevich Sidorenko and Petr Nikolayevich Fedoseyev, vice presidents of the USSR Academy of Sciences, Academician Aleksandr Mikhaylovich Prokhorov, member of the USSR Academy of Sciences Presidium, and other of the country's leading scientists.

Comrade M.G. Gapurov expressed cordial gratitude to the USSR Academy of Sciences and its Presidium for their constant assistance in the development of the republic's production forces and its science and in the training and education of highly skilled science cadres.

Further he expressed sentiments of sincere gratitude to the leaders of the academies of sciences and all scientists of the fraternal republics, who are also making their contribution to the development of Soviet Turkmenistan's science.

Then Comrade M.G. Gapurov said:

The successes in the development of Soviet Turkmenistan's science are indisputable...

However, we believe that what has been achieved must be regarded only as the basis for the transition to a qualitatively higher level of the organization of scientific research.

This is required of us by the program tasks set by the 25th CPSU Congress and the propositions and conclusions contained in the speech of Comrade L.I. Brezhnev, general secretary of the CPSU Central Committee, at our party's Central Committee October (1976) Plenum in relation to a further increase in work efficiency and quality in all links of the national economy and management.

It is necessary to improve work on further combining the achievements of the contemporary scientific-technical revolution with the advantages of

socialism and, in this connection, to raise science's input and operational efficiency in the solution of urgent national economic tasks. It is necessary, figuratively speaking, to seek out and commission unutilized reserves and opportunities in increasing the productivity of scientific labor through its better organization and improvement of the management of science.

The attention of the Academy of Sciences and its Presidium should be concentrated on improving the coordination of scientific work and concentrating scientific forces and material resources on the elaboration of urgent problems of science, both fundamental and applied, connected with the development of the republic's economy and culture, on strengthening science's ties with practice, and on the more effective introduction of scientific achievements into production.

In resolving these fundamental tasks the republic's scientists must constantly be guided in their practical activity by Comrade L.I. Brezhnev's instruction formulated in the CPSU Central Committee Report to the 25th party congress that "...only on the basis of the accelerated development of science and technology will it be possible to solve the final tasks of the social revolution--a fully built communist society."

Life and the practice of communist building with every passing day confront us with new increasingly complex problems whose solution is only possible through the unified efforts of many scientific collectives representing various branches of knowledge.

The development of the republic's national economy in the next few years demands the solution of such a problem as the comprehensive utilization of physical-raw material resources and, primarily, oil, gas, mineral salts, and subterranean waters. The vast reserves of natural gas will enable us to develop the gas-chemical industry more intensively.

In accordance with the 25th CPSU Congress' decisions concerning the development of research into the synthesis of new substances for the national economy and new equipment, it is essential that the chemical scientists intensify work in this sphere and devote particular attention to improving the methods of the processing and comprehensive utilization of the Kara-Bogaz-Gol brines and potassium salts of Gaurdak and Karlyuk.

It is evidently necessary to also draw attention to the expediency of conducting research concerning the utilization of the high-quality Karakumy sand for synthesizing organosilicon compounds and obtaining ceramic articles, optical glasses, and other materials.

Then Comrade M.G. Gapurov dwelt on the tasks confronting the physicists in the sphere of use of solar energy, the radio, and astronomy and in the seismology sphere.

More than 80 percent of the republic's total area, Comrade M.G. Gapurov continued, is desert. The study and assimilation of the vast desert territories is a major national economic problem for the republic. Much has been done by the Turkmen SSR Academy of Sciences' scientists on comprehensive study of the deserts for a scientific evaluation and elaboration of paths of their assimilation, forest improvement, and technical means of struggle against moving sands, on study of the desert soils, and on development of methods of their utilization.

Work is being performed on increasing the efficiency of the utilization of local water resources, particularly of the paths of their accumulation and the use of mineralized waters in agriculture, and in many other directions.

Profound qualitative changes are currently occurring in the republic's agriculture. Specialization and concentration of agricultural production is being effected on the basis of interfarm cooperation and agrarian-industrial integration. We are in need of the more precise, specific, and scientifically substantiated development of a large number of questions in connection with the fact that this task is being resolved on a new technological and organizational basis. We assume that the scientists of the Academy of Sciences, in conjunction with the scientists of the sectorial institutes, will be able to render the republic party organization substantial assistance here.

It is also important to broaden and intensify research in the sphere of genetics, molecular biology, biochemistry, and biological methods of struggle against pests harmful to agricultural crops.

Purposeful work on improving the strains of the cotton plant and on the problems of protecting it against pests and diseases and, particularly, quests for paths and methods of raising its yield should, in our view, be a particularly important direction in the development of agricultural science.

The comprehensive scientific elaboration of questions of the conservation and improvement of the natural environment and of the reproduction of flora and fauna is also becoming increasingly urgent.

A big role in the development of the republic's economy and culture belongs to the scientists working in the sphere of the social sciences.

In recent years, particularly since the appearance of the CPSU Central Committee 14 August 1967 decree "On Measures for the Further Development of the Social Sciences and an Enhancement of the Role in Communist Building," the Turkmenistan scientists--historians, philosophers, economists, and philologists--have scored considerable successes in their important and responsible work. A number of works have appeared devoted to urgent problems of the building of socialism and communism, generalization of the experience of

the activity of the party organization and history of Soviet Turkmenistan, the inception and development of sociopolitical and philosophical thought in our republic, and the further development of its economy.

It is gratifying that the comprehensive elaboration of major problems in conjunction with the academies of sciences of the fraternal republics is becoming an increasingly wiedespread practice in the sphere of the social sciences. A large authors' collective is working on a history of the peoples of Central Asia and Kazakhstan from ancient times to the present day.

Our philologists are actively participating in the elaboration of all-Union problems on the natural patterns of the functioning and development of language and literature.

Important work has been performed by the economists on the elaboration of a master plan for the development of the country's national economy on the basis of the republic's materials.

Economic science and, primarily, that of the academy should elaborate specific measures on increasing social production efficiency and improving its structure and proportions and on problems of socialist expanded reproduction and the utilization of labor resources. A very important direction is the forecasting of the development of the republic's production forces and the utilization of its natural and also labor resources for the long term.

The most unremitting attention should be paid to questions connected with the development of the theory and improvement of the practice of management of the republic's national economy as a whole and of its individual sectors in order to control economic processes on a contemporary scientific basis and have an opportunity to more fully analyze and evaluate our adopted economic decisions from the viewpoint of their immediate and long-term consequences.

More intensified study is demanded by questions of the working people's ideological education and the shaping of the new person--the active builder of a communist society--and the elaboration of more effective means and methods for increasing influence on the processes of social development.

It is essential that more attention be paid to questions of cadre training and the raising of a worthy young scientific replacement shift and that fuller use be made of the forms of this work that have given a good account of themselves in practice.

The republic Academy of Sciences Presidium, the leaders of research institutes and VUZ's, and the party organizations must earnestly improve this work. It is essential to display more concern for the Marxist-Leninist tempering of scientists, particularly the young replacement shift, and to rear them in a spirit of patriotism and internationalism and high civic responsibility for the results of their labor. For the successful solution of these tasks it is essential to create in the collectives of the scientific establishments a healthy psychological climate and an atmosphere of

comradely mutual assistance and mutual exactingness and of creative discussion calling for bold scientific quest and to comprehensively develop healthy, benevolent criticism and self-criticism.

Turkmenistan's scientists have always lived with the interests of their great multinational socialist motherland. Together with all Soviet scientists and all working people they are active participants in the country's sociopolitical life and are persistently struggling for the implementation of the plans of communist building.

The Turkmenistan Communist Party Central Committee and the Turkmen SSR Supreme Soviet Presidium and Council of Ministers wish the republic's scientists new creative successes and express the firm confidence that they will continue to lend all their forces, knowledge, and experience to the successful implementation of the far-reaching outlines of the historic 25th CPSU Congress.

Dear comrades! Today's papers carry the greeting of the Turkmenistan Communist Party Central Committee and Turkmen SSR Supreme Soviet Presidium and Council of Ministers to the Academy of Sciences, the scientists, and all scientific workers of our republic. It makes a high evaluation of your labor, expresses the warmest wishes, and determines further tasks in the development of science.

Permit me to extend these greetings to you and once again wholeheartedly wish you new, creative successes.

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RECIPIENTS OF KIRGIZ SSR STATE PRIZES

Frunze SOVETSKAYA KIRGIZIYA in Russian 10 Nov 76 p 2

[Article by K. Karakeyev, chairman of the Kirgiz SSR State Prizes Committee and corresponding member of the USSR Academy of Sciences: "The Alliance of Science and Practice"]

[Text] In his speech at the CPSU Central Committee October (1976) Plenum L.I. Brezhnev, general secretary of the CPSU Central Committee, made an in-depth dialectical analysis of the domestic and foreign policies of our Communist Party and the Soviet state and formulated the urgent tasks and paths for the implementation of the decisions of the 25th CPSU Congress. Comrade L.I. Brezhnev observed that the scientists and production workers had initiated an enormous amount of work on strengthening science's ties with production and on the successful solution of the tasks of the 10th Five-Year Plan.

It is traditional that on the eve of the Great October Revolution fundamental and applied research which is contributing to the growth of the Soviet people's well-being, developing education and culture, and strengthening our technical might and the power-worker ratio is rewarded with state prizes.

The Kirgiz Communist Party and the Kirgiz SSR Council of Ministers have awarded Kirgiz SSR State Prizes in the sphere of science and technology to a large group of scientists and specialists of the republic's national economy.

Efficiency and quality is the principal motto of the 10th Five-Year Plan. These tasks are being successfully resolved in the works of authors' collectives which are now winners of the republic's State Prize. It is logical that this high award has been conferred on complexes of works in the sphere of mechanical engineering and mining machine building, the application of modern means of automation for improving the utilization of water and land resources, and systems enhancing the efficiency of the cultivation and harvesting of one of the republic's principal agricultural crops--sugar beet.

A high assessment has been put on the work of the scientists of the Kirgiz SSR Academy of Sciences and the Frunze Polytechnical Institute entitled "Scientific Principles of the Rating, Designing, and Operation of Drilling Equipment."

This work was begun in Kirgizia more than 10 years ago. It was devoted to the problem of the mechanization and automation of an exceptionally labor-intensive and heavy process of mining production--the drilling of bore holes and wells in very hard rock. Now it may confidently be said that an original school of scientists, well known in the Union and abroad, has taken shape in Frunze which has devoted its work to an important sphere of mechanical engineering and mining machine building. A characteristic feature of this school is the solution of a full package of tasks from the theoretical substantiation of phenomena occurring in the process of the interaction of mining machinery with the surroundings which are being worked through the creation of mobile highly productive drilling units and automatic machinery.

Fundamental research has been developed in the direction of such urgent sections of mining and the theory of machinery and mechanisms as optimization of the processes of the destruction of rock during drilling, the synthesis of mechanisms and machinery with the optimum parameters, development of the theory of power impulse systems, and of the hydrovolumetric and combined drives of vibration-impact and drilling machines.

Practice shows that the path from the idea to its embodiment is very complex. It requires the participation of the most varied specialists and organizations. Thus the contribution which the Kirgiz school of mining mechanical engineers has succeeded in making to mining science and practice is all the more impressive.

A big contribution to the solution of the problem of increasing the efficiency of the utilization of the republic's water and land resources is the elaboration and introduction of comprehensive facilities for the operational control of water distribution performed by the scientists and specialists of the Kirgiz SSR Academy of Sciences Institute of Automation, the all-Union "Soyuzvodavtomatika" Association, the Kirgiz Agricultural Institute, and the Kirgiz SSR Ministry of Reclamation and Water Economy.

In accordance with the decisions of the 25th CPSU Congress, in the 10th Five-Year Plan it is planned to irrigate up to 4 million hectares and water 37.6 million hectares of pasture in desert and mountainous regions. Some 35,000 hectares of irrigated land have to be commissioned and 500,000 hectares of high mountainous pasture have to be watered in the Kirgiz SSR alone.

It is not fortuitous that such great significance is attached to irrigated farming. The Report at the 16th Kirgiz Communist Party Congress noted that each irrigated hectare yields four-five times more products than unirrigated land. Stable harvests of agricultural products, irrespective of the whims of nature, are secured here.

Yet even now the water resources of the republic, and not only of the republic, are limited. In this connection there arises on the agenda the question of the intensification of irrigated farming through the introduction of measures insuring the more economical utilization of irrigation water, an improvement in the reclamative state of the soil, and economically optimal watering regimes for agricultural crops.

A considerable expansion of irrigated farming requires not only the construction of additional water storage basins, canals, and dams but also the elaboration of new means and methods of controlling the irrigation systems guaranteeing the timely feed to the consumers of the necessary water quotas depending on the state of soil moisture and structure.

The Kirgiz scientists have conducted a great deal of scientific research in the plane of set tasks. As a result scientific principles were elaborated for the formation of operational control systems for the major water economy complexes, including water storage basins, and an extensively developed network of trunk and interfarm canals was developed.

Operational control makes it possible to effect the diversion of flow from one sector of the system to another and to take into account here the data of the forecast with respect to the sources of irrigation and supplies of water in the storage basins.

The work includes the extensive introduction of original designs of new instruments, remote control facilities, and computers. More than 60 installations at the rivers and canals have been equipped with automated control systems. The overall annual savings from all the automated systems constitutes approximately 1 million rubles.

A serious contribution to the development of agricultural science and practice was the work executed by the collective of authors under the leadership of Candidate of Agricultural Sciences D.A. Akimaliyev entitled "Development and Introduction Into Production of a Scientifically Substantiated System of the Cultivation and Harvesting of Irrigated Sugar Beet in the Kirgiz SSR."

The scientifically substantiated system of the cultivation of sugar beet on the irrigated land of the Chuyskaya valley, which is being extensively put into practice, has enabled the kolkhozes and sovkhozes of the beet-sowing regions to raise the overall standard of farming and increase the yield of the roots of sugar beet. In recent years alone the breeders of the Kirgiz Scientific Research Institute of Farming Sugar Beet Experimental-Breeding Station have cultivated and zoned three strains--the Kirgiz monospermous 8, the Kirgiz hybrid, and the Kirgiz polyhybrid 18--and undertaken three strain changes. Each subsequent strain has surpassed the previous zoned strain with respect to yield.

It is extremely important that in the system of sugar beet cultivation recommended for introduction into production a special place is occupied by questions of the techniques of its cultivation and harvesting.

The achievements of the Kirgiz SSR State Prize winners are a worthy contribution to the science of the Country of Soviets. Soviet science is today inseparably connected with the magnificence of the accomplishments of our entire people, who are confidently proceeding along the path of building a communist society.

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